

# EXERCISES

For more practice, see *Extra Practice*.

## Practice and Problem Solving

### **A** Practice by Example

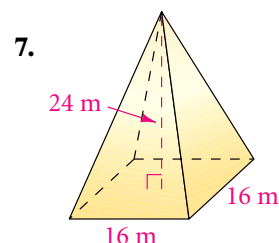
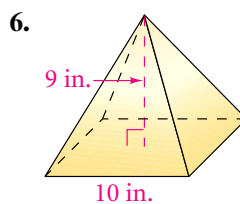
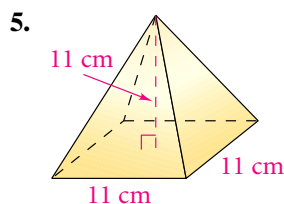
**Example 1**  
(page 552)

1. The entrance to the Louvre Museum in Paris, France is a pyramid. The height of the pyramid is about 70 ft and the area of its base is about  $10,000 \text{ ft}^2$ . What is the volume of the pyramid?

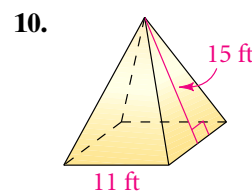
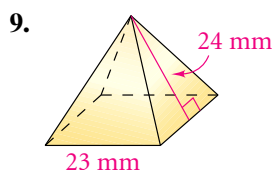
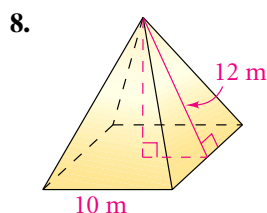
**Find the volume of a square pyramid with the following dimensions.**

2. base edges 10 cm, height 6 cm      3. base edges 18 in., height 12 in.      4. base edges 5 m, height 6 m

**Find the volume of each square pyramid.**



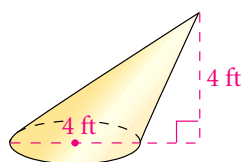
**Example 2**  
(page 552)



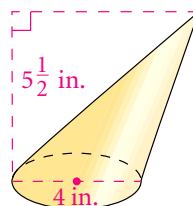
**Example 3**  
(page 553)

**Find the volume of each cone in terms of  $\pi$  and also rounded as indicated.**

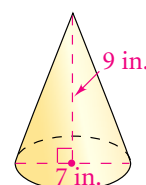
11. nearest cubic foot



12. nearest cubic inch



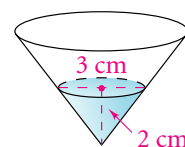
13. nearest cubic inch



**Example 4**  
(page 554)

14. **Chemistry** In a chemistry lab you use a filter paper cone to filter a liquid. The diameter of the cone is 6.5 cm and its height is 6 cm. How much liquid will the cone hold when it is full?

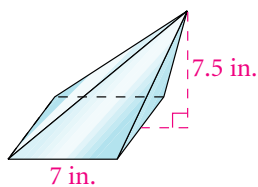
15. **Chemistry** This funnel has a filter that was being used to remove impurities from a solution but became clogged and stopped draining. The remaining solution is represented by the shaded region. How many cubic centimeters of the solution remain in the funnel?



# **B Apply Your Skills**

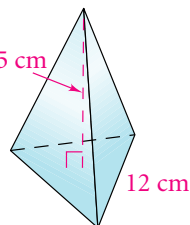
**Find the volume to the nearest whole number.**

16.



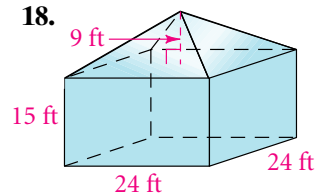
Square base

17.



Equilateral base

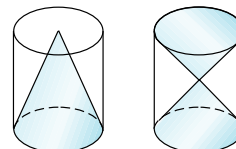
18.



Square base



**19. Writing** The two cylinders pictured at the right are congruent. How does the volume of the larger cone compare to the total volume of the two smaller cones? Explain.



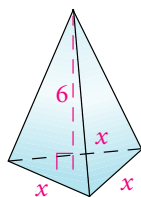
**20. Architecture** The Transamerica Pyramid in San Francisco (see photo at left) is 853 ft tall with a square base that is 149 ft on each side.

- What is its volume to the nearest thousand cubic feet?
- Imagine, in place of the Transamerica Pyramid, a building in the shape of a prism with the same square base as the Pyramid. How tall would this building have to be to have the same volume as the Pyramid?



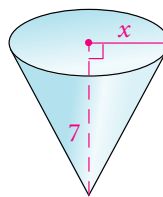
**Algebra** Find the value of the variable in each figure. Leave answers in simplest radical form. The diagrams are not to scale.

21.



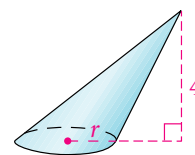
Volume =  $18\sqrt{2}$

22.



Volume =  $21\pi$

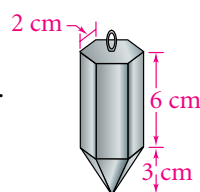
23.



Volume =  $24\pi$



**24. Hardware** Builders use a plumb bob to find a vertical line. The plumb bob shown combines a regular hexagonal prism with a pyramid. Find its volume to the nearest cubic centimeter.



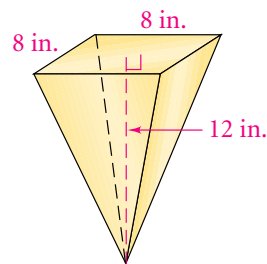
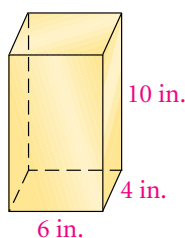
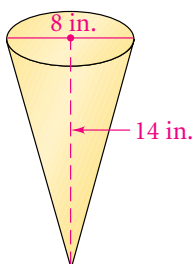
**25. Open-Ended** A cone has a volume of  $600\pi$  in.<sup>3</sup>. Find two possible sets of dimensions for its height and radius.

**26.** A cone with radius 1 fits snugly inside a square pyramid which fits snugly inside a cube. What are the volumes of the three figures?

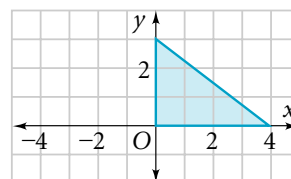
**27.** A cone with radius 3 ft and height 10 ft has a volume of  $30\pi$  ft<sup>3</sup>. What is the volume of the cone formed when the following happens to the original cone?

- The radius is doubled.
- The height is doubled.
- The radius and the height are both doubled.

**28.** List the volumes of the cone, prism, and pyramid in order from least to greatest.



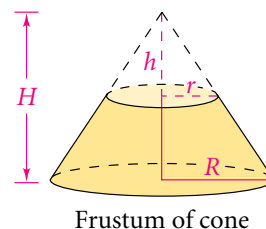
**Visualization** The plane region is revolved completely about the given line to sweep out a solid of revolution. Describe the solid. Then find its volume in terms of  $\pi$ .



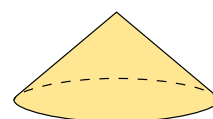
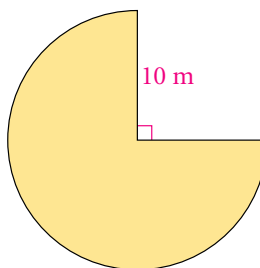
**Challenge**

29. the  $y$ -axis                      30. the  $x$ -axis  
31. the line  $x = 4$                 32. the line  $y = -1$

33. A *frustum* of a cone is the part that remains when the vertex is cut off by a plane parallel to the base.  
a. Explain how to use the formula for the volume of a cone to find the volume of a frustum of a cone.  
b. **Containers** A 9-in. tall popcorn container is the frustum of a cone. Its small radius is 4.5 in. and its large radius is 6 in. What is its volume?

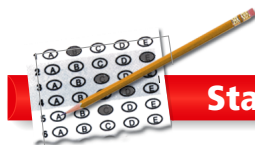


34. A disk has radius 10 m. A  $90^\circ$  sector is cut away, and a cone is formed.  
a. What is the circumference of the base of the cone?  
b. What is the area of the base of the cone?  
c. What is the volume of the cone? (*Hint:* Use the slant height and the radius of the base to find the height.)



**Graphing Calculator** In Exercises 35 and 36, the volume of the solid is  $1000 \text{ cm}^3$ . Use the Exploration on page 536 to help you complete each exercise.

35. For a square pyramid, find the length of a side of the base for which the lateral area is as small as possible.  
36. For a cone, find the radius for which the lateral area is as small as possible.



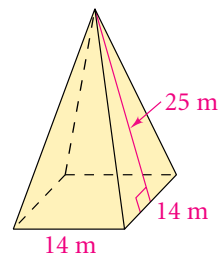
**Standardized Test Prep**

**Multiple Choice**

37. What is the volume of a 6-ft high square pyramid with base edges 8 ft?  
A.  $128 \text{ ft}^3$                       B.  $192 \text{ ft}^3$                       C.  $256 \text{ ft}^3$                       D.  $384 \text{ ft}^3$

**Short Response**

38. What is the volume of a cone with diameter 21 m and height 4 m?  
F.  $147\pi \text{ m}^3$                       G.  $220.5\pi \text{ m}^3$                       H.  $294\pi \text{ m}^3$                       I.  $441\pi \text{ m}^3$   
39. What is the volume of an oblique cone with radius 9 cm and height 12 cm?  
A.  $324\pi \text{ cm}^3$                       B.  $486\pi \text{ cm}^3$                       C.  $648\pi \text{ cm}^3$                       D.  $972\pi \text{ cm}^3$   
40. What is the volume of the square pyramid at the right?  
F.  $1568 \text{ m}^3$                       G.  $1633 \text{ m}^3$   
H.  $2352 \text{ m}^3$                       I.  $2450 \text{ m}^3$   
41. What is the volume of an oblique square pyramid with base edges 25 in. and height 24 in.?  
A.  $5000 \text{ in.}^3$                       B.  $7500 \text{ in.}^3$   
C.  $10,000 \text{ in.}^3$                       D.  $15,000 \text{ in.}^3$



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42. The volume of a cone is  $82,418\pi \text{ cm}^3$ . Its diameter is 203 cm. What is its height? Show all your work, including any formulas that you use.



### Lesson 10-5

**43. Sports** A cylindrical hockey puck is 1 in. high and 3 in. in diameter. What is its volume in cubic inches? Round your answer to the nearest tenth.

**44.** A triangular prism has height 30 cm. Its base is a right triangle with legs 10 cm and 24 cm. Find the volume of the prism.

### Lesson 9-5

**45.** Find the area of a regular pentagon with a radius 5 in. Give your answer to the nearest tenth of a square inch.

### Lesson 7-3

**Find the area of each equilateral triangle to the nearest tenth of a square unit.**

**46.** The triangle has 12 cm sides.

**47.** The triangle has 10-in. altitudes.

**48.** Find the area of a  $30^\circ$ - $60^\circ$ - $90^\circ$  triangle with shorter leg of length 4 cm.

## Geometry at Work

### .....Package Designer

**Each** year, more than one trillion dollars in manufactured goods are packaged in containers. To create each new box, bag, or carton, package designers must balance such factors as safety, environmental impact, and attractiveness against cost of production.

Consider the three boxes of dishwasher detergent. All three boxes have standard volumes of  $108 \text{ in.}^3$ . The boxes have different shapes, however, and different surface areas. The box on the left has

the greatest surface area and therefore costs the most to produce. Despite the higher cost, the box on the left has become standard. In this case, the least expensive package on the right is too difficult for a consumer to pick up and pour.



**Take It to the NET** For more information about package design, go to **www.PHSchool.com**.

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